



A Collaborative Learning Community

“Don’t Get too Stressed”

by: Ethan Burghardt

PHEOCS Investigation

There are many things that can happen when you are scared. First, your muscle cells lose polarity. When you are at rest your muscle cells are polarized. When they are facing emotions, there are an excess amount of ions across the muscle cell membranes. These ions are positive sodium ions. An excess amount of these causes a positive charge on the cell membrane. An EKG (or ECG) sensor can read the potential positive charge of the cell membrane in millivolts. (mV)

Information was found on the EKG sensor manual provided by Vernier

Questions

What is your pulse rate?

- My resting heart rate is 87 beats per minute.

Your heart rate depends on what 3 things?

- Blood pressure, maintenance temperature, and heart health.

Where can you measure your pulse rate on your body?

- Your wrists and neck.

How do you measure your pulse rate at your wrist?

- You can count the beats you feel in 30 seconds and double it.

How do you measure your pulse rate at your neck?

- You find a vain and count the amount of beats in 30 seconds times 2.

Describe step by step how you take your pulse rate.

- First you find the artery right below your chin, and half way to the back of your neck
- Next, you press your index and pointer finger in the hollow feeling spot.
- Last you count how many beats while watching a clock for 30 seconds, and double it.

What has the National Institutes of Health and the American Heart Association reported about a normal resting heart rate for teenagers?

- 60 to 90 beats per minute.

Found at <http://answers.webmd.com/answers/1182407/what-is-a-normal-heart-rate>

Questions Cont.

What should your pulse rate be during moderate exercise?

- 125-155 beats per minute (bpm)

What should your pulse rate be during intense exercise?

- 156-195 beats per minute (bpm)

What is a normal body temperature?

- 98.6 degrees Fahrenheit

What is blood pressure?

- Blood pressure is the amount of pressure against the walls of your veins.

What happens to the blood vessels and the heart as a response to increased body temperature?

- The veins swell to accommodate more blood flow, so oxygen can rush to the brain.

What happens to the peripheral blood vessels when the body temperature drops?

- They slow to conserve energy.

What happens to the peripheral blood vessels when the body's temperature increases?

- They speed up so the body can operate faster.

Commonly asked questions

What is an EKG?

-An EKG is a graphic recording of your heart's electrical activity.

What does it do?

-The EKG sensor can give your cardiologist a full view of your hearts well being, history, and health.

Are there any risks?

-No there is not. An electrocardiogram is a safe and painless test, with no known risks. An EKG is not for you if you are allergic to any adhesives or hospital grade tape. The Surgeon General himself has declared that there is no need for a consent form in the instance of an EKG.

Found at: <http://www.childrenshospital.org/az/Site494/mainpageS494P1.html>

Contacting Experts

My expert is Mrs. Lisa Johanek, PhD of neuroscience.

One of her suggestions was:

To ensure proper statement of the conclusions, it would be helpful to tease apart the EKG signals from the EMG signals. I believe there is data there to show that something physiological is happening with surprise/fear, but more analysis of the data is needed to convince me that there is a change in EKG and not a change in skeletal muscle/muscle contractions with fright.

My questions were quite simple.

1. Do you agree with my hypothesis?
2. Do you have any recommendations to add to my experiment?
3. Do you see any flaws in my experiment?

lisa.johanek@gmail.com

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Background Information- Contacting Expert

Hypothesis

A stressful environment will cause a rise of potential mV in the heart.

PHEOCS Hypothesis

Setting up Labquest and sensor.

1. Turn on the Labquest by pressing red power button.
2. Plug the white connector plug into the CH 1 port that can be found next to the red power button. Take care to line up the tapered end to the tapered slot. If it doesn't seem to fit properly without forcing it please see a teacher.
3. Select the measurement of potential mV.
4. Next select the duration button on the right to pull up its menu. Change the duration of data collection by pressing in the white box that has a number there. Change this number to read 900 (15 min) and press done. Then press OK.
5. Now switch to the graphing mode by pressing the graph icon on the upper right (the graph with a red line on it)
6. Your LabQuest and data logger is now ready to collect data.



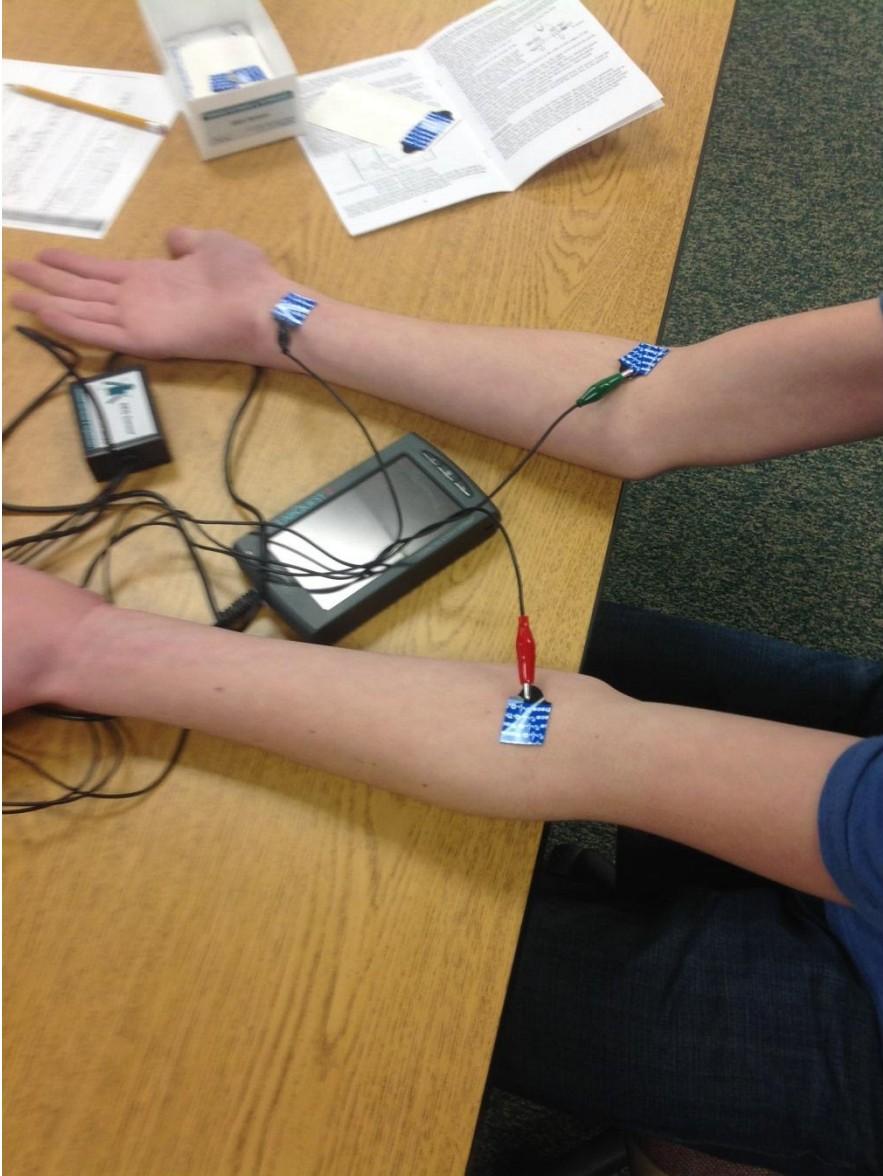
Your EKG sensor will look like this when taken out of the package. It will include the sensor, 100 electrodes, and a user manual.

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Designing experiment ↑

Test Procedures

1. Put one electrode on the left medial basilic vein. (The visible blue vein on the forearm)
2. Put another electrode on the right medial cubital vein.
3. Put another in-between the right cephalic and dorsal venous veins.
4. Clip the green clip to the right forearm electrode. (- negative)
5. Clip the red clip to the left forearm electrode. (+ positive)
6. Clip the black clip to right inside wrist. (reference)
7. Press the run button on the LabQuest. (Green triangle at the bottom left of the screen)
8. Wait for the test to be over or for the time to run out. (The LabQuest will automatically stop running when time runs out)
9. Press file then press save.
10. Type in the name of the experiment.



Test Procedures cont.

This is how your EKG sensor will look when set up properly on the subject.

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Designing ↑ experiment

	A	B	C
1		T1	T2
2	Location		G105
3	Subject	Sam VanBuskirk	Ethan Burghardt
4	Condition	Dark	Light
5	Variable	Fright	Fright
6	Date	1/24/2013	1/24/2013
7	Time	11:00 AM	10:45 AM
8	Activity	Haunt	Elementary
9	Max mV	1.883	-0.06
10	Norm mV	1.003	-0.91
11	Min mV	0.019	-4.468

The table describes the variables, conditions, and results. It was used to plan the experiment as well as set it up before running it. Haunt and Elementary are both horror based games. The test were ran in an isolated environment.

PHEOCS Data Table

Materials List

Vernier Lab Quest

Vernier EKG sensor (EKG-BTA)

Hp ProBook 6560b

SanDisk Cruzer 4 gb mass flash storage device

Apple ipod touch 4th gen, 32 gb

Apple licensed headphones

Vernier Q-Trace EKG electrodes

Fuji Film XP Digital Camera

The Oxford Handbook of Functional Data Analysis (US LOC Control #2010032107)

Methods for Data Acquisition and Evaluation of Electro-Cardiograms (US LOC Control #75372482)

Vernier Logger Pro 2 desktop software

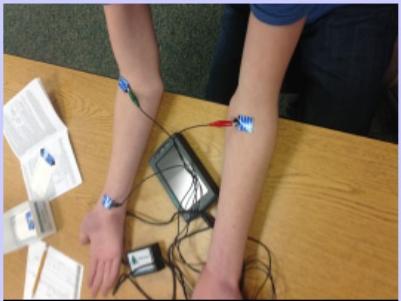
SLENDER The Game (product version 3.5.3.44447) (file version 3.5.3.44447)

“Chasing Cars” Snow Patrol

“Scatta” Skrillex (featuring Foreign Beggars and Bare Noise) 2004

HAUNT The Game (product version 3.5.6.44817) (file version 3.5.6.44817) pub. By Microsoft Studios

PHEOCS Designing experiment

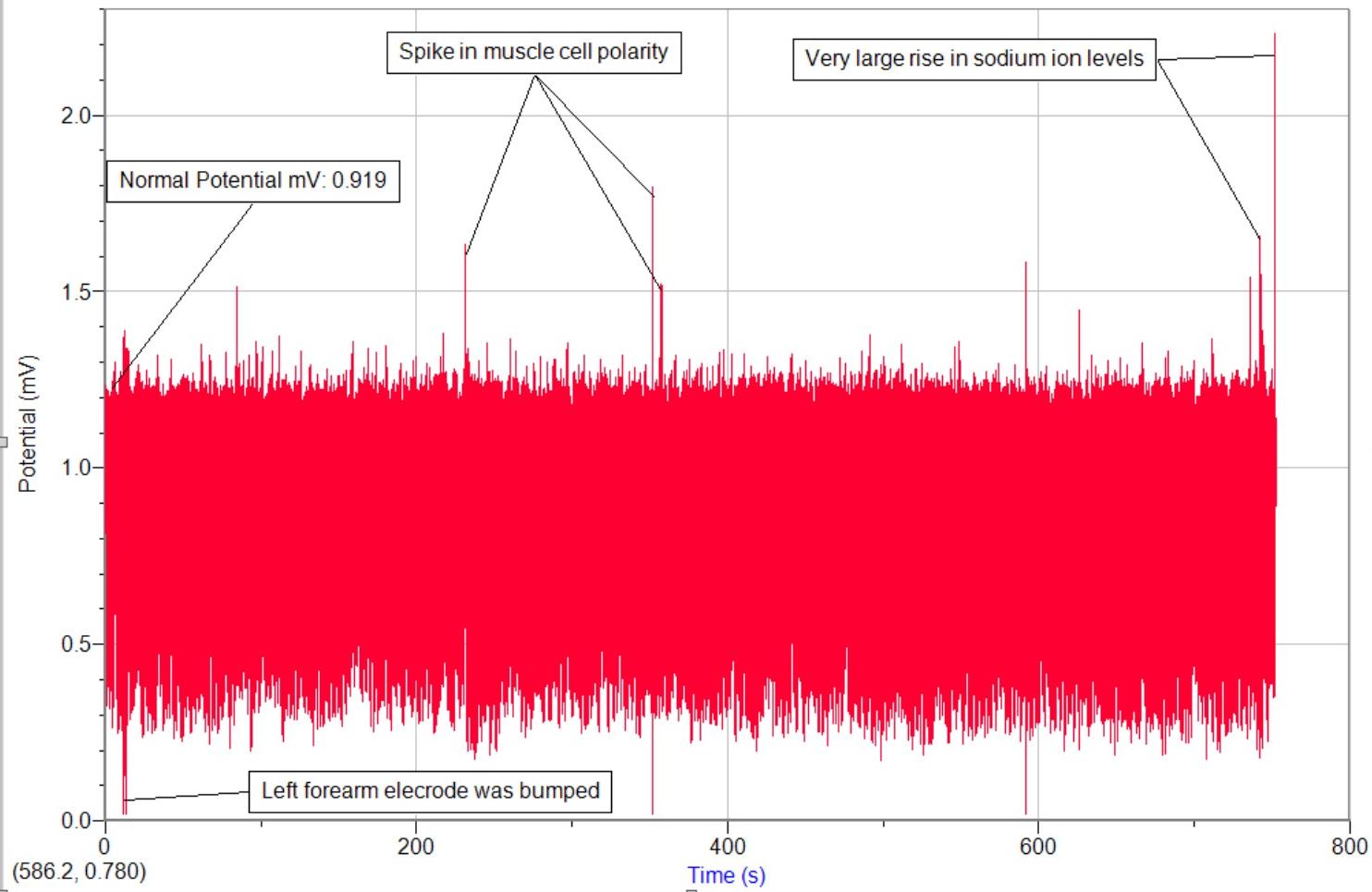


The setup of the EKG sensor.



The Vernier EKG sensor (EKG-BTA) was used for the experiment

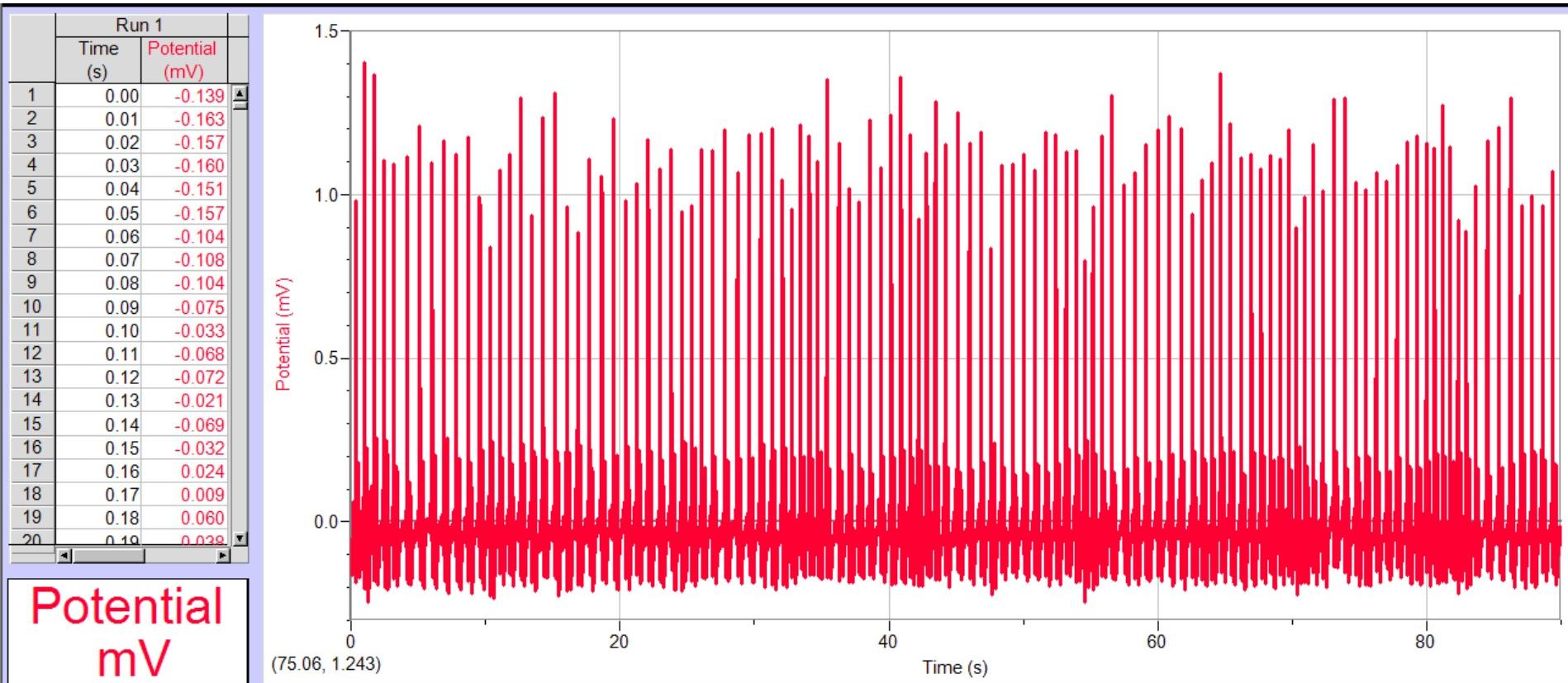
Test conducted by Ethan Burghardt
Conducted upon Sam VanBuskirk
Conduction on 1/28/13



This is the third test conducted on Sam VanBuskirk.

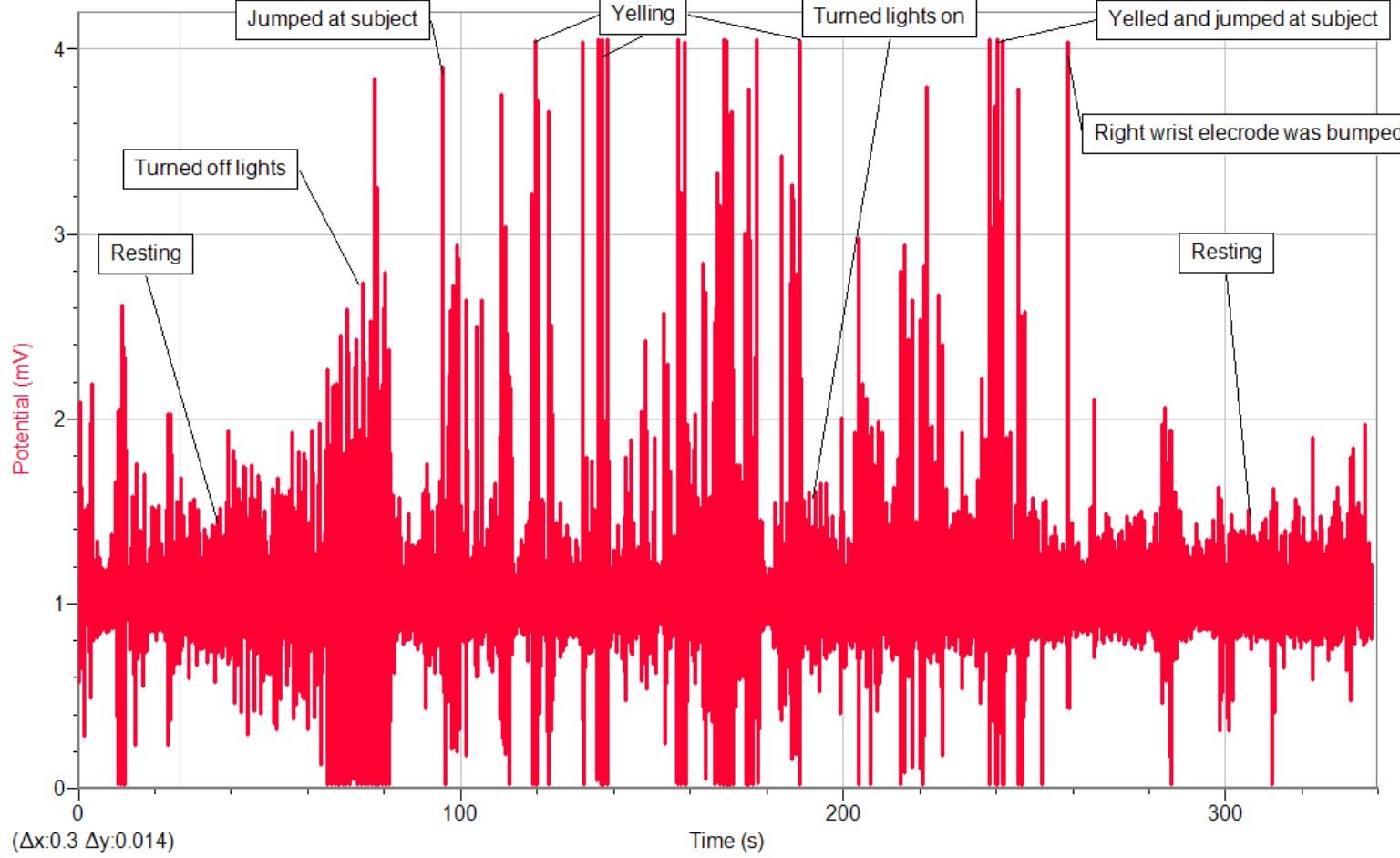
This was conducted on 1/28/13 at 11:00 AM on The amount of mV with the variable of fear

PHEOCS Observations



This is the resting mV conducted on Sam VanBuskirk.

PHEOCS Observations



This is the compiled mV test conducted on 2/1/13 at 9:45 AM on Brooke Jahner.

These spikes are muscle contractions in the forearms when stressed. These are not apparent from the surface of the skin.

PHEOCS Observations

Explanation

In the test on the previous slide, the spikes are muscle contractions in the forearms when stressed. These are not apparent from the surface of the skin. My expert (Lisa Johanek) recommended that I add this for clarity of the experiment that was ran.

Link to the information emailed by Lisa Johanek below.

<https://docs.google.com/a/foxwestacademy.org/viewer?a=v&pid=gmail&attid=0.1&thid=13ca7d0047adac37&mt=application/vnd.openxmlformatsofficedocument.wordprocessingml.document&url=https://mail.google.com/mail/u/0/?ui%3D2%26k%3Dbec242aaa6%26view%3Datt%26th%3D13ca7d0047adac37%26attid%3D0.1%26disp%3Dsafe%26zw&sig=AHIEtbTAYac8QDS8Y-FePHANDcSHFHPJ2A>

PHEOCS Observations

Conclusion

Based on my research I have concluded that rises in emotion, stress, and fear will cause a flourish in potential mV and sodium ions in the heart.

- Rises in emotion will cause flourishes in sodium ion levels on the muscle cell membranes.
- There are many different things that can cause the heart to rise in polarity and charge.

PHEOCS Conclusions

Written Observations

- On test 3 the left forearm electrode was bumped causing an un natural and un necessary spike on the data collecting.
- On test 4 the right wrist electrode was bumped causing an un natural spike in data collecting.

PHEOCS Observations

Applications

Information from an EKG can be used in many ways.

- An electrocardiogram can detect many diseases such as coronary heart disease.
- EKGs can show heart arrhythmia.
- Congenital heart defects or birth defects of the heart.
- An EKG can tell if you are at risk for heart failure.
- Heart valve disease prediction
- Inflammation of the sac that surrounds the heart. (Pericarditis)
- Heart muscle that's too thick or parts of the heart that are too big (cardiomyopathy)

Found at: http://www.nhlbi.nih.gov/health/dci/Diseases/ekg/ekg_show.html

Credits and Resources

Vernier

US Library of Congress

Mark J. Hadley of Parasec Productions

SanDisk

Apple inc.

Hewlet Packard inc.

Lisa Johanek, Phd of neuroscience

Fuji Flim corp.

NanaOn-Sha and Zoë Mode

PHEOCS Cite resources